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THE UNIVERSITY OF ALBERTA

OVERCORRECTION AS AN EDUCATIVE PROCEDURE IN THE TREATMENT OF MALADAPTIVE SELF-STIMULATION

by

© PATRICK CARNEY

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled .....
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ABSTRACT

Positive practice overcorrection has been used effectively to reduce the rates of stereotypic self-stimulation displayed by retarded and autistic children. Because overcorrection involves the punishment of undesirable behaviours through forced practice of an alternative activity it was hypothesized that the behaviours practiced might become aversive. Consequently, there would be a decrease in frequency of both the positive behaviours being practiced and the behaviours for which punishment was intended.

In the present study a multiple-baseline-across-subjects design was used to assess the effects of positive practice on rates of play behaviours practiced in an overcorrection procedure. The subjects were three developmentally handicapped children between the ages of $4\frac{1}{2}$ - 5 years. Behaviours treated by overcorrection were stereotypic object-mouthing, stereotypic headwags, and throwing toys. Rates of other behaviours not involved in overcorrection were also monitored and side-effects of treatment were analyzed.

Results demonstrated that the $2\frac{1}{2}$ minute episodes of positive practice brought about a reduction in toy-throwing but failed to produce a substantial decrease in the rates of object-mouthing and head-wagging.

Positive practice did not reduce the frequency of toy playing activities. Rather, sporadic increases were noted over rates of play maintained during baselines.

The results indicated that in some instances episodes of positive practice may be used to teach new behavioural alternatives to replace the undesirable behaviours punished by overcorrection.

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CHAPTER I

INTRODUCTION

Self-stimulatory behaviour is a problem common to many abnormal populations including the retarded, the autistic, the schizophrenic and the blind (Baumeister and Forehand, 1973). Surveys conducted by Berkson and Davenport (1962) as well as Kaufman and Levitt (1965) indicated that two-thirds of the institutionalized retarded exhibited self-stimulatory behaviour. Rimland (1964) noted that self-stimulation is considered to be one of the defining characteristics for the autistic child.

Self-stimulatory behaviour consists of stereotyped, repetitive motor acts or sequences of behaviour which have no apparent functional effect on the environment. Examples are body rocking, hand waving, and head weaving (Kaufman and Levitt, 1965; Berkson, 1967), mouthing or rubbing parts of one's body (Berkson and Mason, 1964; Hollis, 1965; Hutt and Hutt, 1965), spinning objects (Hutt and Hutt, 1965; Kaufman, 1967; Campbell, 1968; Lovaas, Litrownik, and Mann, 1971), eye poking, body twirling, pill rolling and face slapping (Baumeister and Forehand, 1973).

The occurrence of self-stimulatory behaviour is generally associated with reduced level of positive interaction with the environment (Berkson and Mason, 1964b; Koegel and Covert, 1972; Lovaas et al., 1971).

Any stereotype that dominates the individual's behaviour will obviously limit his opportunity to learn new functionally adaptive responses. For this reason it is important that investigators continue to search for the most expedient method to eliminate undesirable self-stimulatory behaviour. To date, only behaviour modification procedures have proved to be generally useful in dealing with stereotyped behaviours. Although physical restraint and medication have also been applied these methods have failed to produce a reduction in self-stimulation that continues when the restraint or medication is removed (Baumeister and Forehand, 1976).

Although self-stimulatory behaviour is particularly prevalent among the institutionalized retarded, such acts also occur among non-retarded and non-institutionalized individuals. Gesell and Amatruda (1941) regarded the stereotyped movements of retarded persons as fixations of normal patterns which normal children manifest but outgrow. A negative correlation obtained between the incidence of stereotyped behaviours in children and IQ supports the notion of a developmental influence (Berkson and Davenport, 1962). Lourie (1959) estimated that the incidence of body rocking, body swaying or head banging in private pediatric practice was about 10% and may be as high as 20% in a pediatric clinic population. In most cases it can be expected that the stereotyped

behaviours will be transitory, typically persisting for only a short period of time. Only rarely do these behaviours assume chronic dimensions among the typical pediatric population (Baumeister and Forehand, 1973).

Over the past few years a procedure has been developed for use with individuals who display self-stimulatory behaviours. The procedure, positive practice overcorrection, consists of: (a) a verbal warning to cease the stereotyped behaviour; (b) physically preventing further occurrence of the response; (c) forced practice of an appropriate behaviour alternative; and (d) release from forced practice (Wells, Forehand, and Green, 1977).

Proponents of overcorrection indicate two major functions of the positive practice technique: first, to eliminate an undesirable behaviour and, second, to increase the frequency of more appropriate behaviour alternatives being taught (Azrin, Kaplan, and Foxx, 1973; Foxx and Azrin, 1973). Several investigations (Azrin et al., 1973; Doke and Epstein, 1975; Epstein, Doke, Sajwaj, Sorrell, and Rimmer, 1974; Foxx and Azrin, 1973) have documented varying degrees of success in accomplishing the first of these purposes with overcorrection. However, as noted by Wells et al. (1977), evidence in support of the notion that overcorrection makes appropriate behaviours more likely to occur is uncertain. More specifically, confusion exists as to whether the positive practice

routine itself makes a practiced behaviour reinforcing and more probable than other behaviour alternatives, or, whether the routine makes the practiced behaviour aversive and less probable than other behaviour alternatives.

Causal Theories of Stereotyped Mannerisms

Not all investigators support the view that stereotyped behaviours are self-stimulatory in nature. Baumeister and Forehand (1973) cite a number of diverse theories which have been advanced to account for stereotyped behaviours. These vary in their relative emphasis on organismic and environmental factors. One popular notion has been that stereotyped behaviour is an expression of tension, discomfort, or unsatisfied needs (Brody, 1960; Gerard 1957; Ilg and Ames, 1955; Kaufman and Levitt, 1965). Accordingly some authors (Klaber and Butterfield, 1968) have proposed that body rocking might be an indicative measure of a lack of institutional effectiveness in meeting human physical needs.

The inherent weakness of any causal theory of stereotyped responding is oversimplification of a very complex phenomenon. Not only are there many different forms of stereotypy possible in any one institutional setting but, also, the developmental history of any one child displaying stereotyped mannerisms is complex. Many factors influence the behaviour of an individual and it

is the identification of specific variables which will effectively change behaviour which provides the tools for treating children displaying stereotyped movements. The theory of unsatisfied needs does not specify what the needs are or how they should be satisfied.

Another view is that human infants possess a kinesthetic drive (Kulka, Fry, and Goldstein, 1960) which will be expressed in stereotyped activities if movement is restrained. The observation of stereotyped behaviours in normal children confined to cribs because of illness (Levy, 1944) is used to support this idea. An alternative explanation would be boredom. Likewise, one might interpret this observation to mean that children have a need for space otherwise they will become agitated. The point is that there are always many possible explanations and there are probably many factors involved in the development of any particular stereotype. For these reasons the behaviourist seeks to establish functional relationships among the factors involved by showing reliable changes in the stereotypes as independent variables are systematically manipulated.

Some investigators hold the viewpoint that stereotyped behaviours may be superstitiously developed and maintained by adventitious reinforcement (Spradlin and Girardeau, 1966; Hollis, 1971). The theory is that an impoverished institutional environment restricts the

occurrence of functional behaviours and thus it becomes probable that non-functional behaviours will be inadvertantly reinforced by the noncontingent presentation of food or social interaction. Some degree of control was obtained over stereotyped responding by Hollis (1971) when accidental reinforcement of these behaviours was prevented.

The theory that stereotyped behaviours are superstitiously developed is quite contrary to the theory that such behaviours are self-stimulatory in nature. The notion of self-stimulation is becoming increasingly popular in current literature (Azrin, et al., 1973; Foxx and Azrin, 1973; Koegel, Firestone, Kramme, and Dunlap, 1974; Wells et al., 1977) and it is the basis from which the positive practice overcorrection routine for stereotyped mannerisms has developed (Foxx and Azrin, 1973).

From a reinforcement orientation, persons who frequently engage in maladaptive self-stimulation may be considered to suffer from a lack of adequately reinforced behaviours directed toward their physical and social environment. Foxx and Azrin (1973) believe that intellectual, physical or perceptual deficits may have been responsible for outward directed behaviours to be extinguished or punished. They further assume that all persons require an optimal level of stimulation to survive and thus they view stereotyped behaviours as an alternate

means by which an individual can obtain such stimulation. In this light self-stimulation may be considered as self-perpetuating or self-reinforcing.

Other writers have theorized that organisms will seek an optimal level of sensory stimulation (Leuba, 1955; Berlyne, 1960). Level of stimulation is seen as a "homeostatic" condition. When this condition is altered the individual will engage in compensatory behaviours. Foxx and Azrin (1973) suggest that stereotyped, inward-directed activities are reinforced by stimuli of a tactual, proprioceptive and sensory nature while incompatible outward-directed activities are reinforced by stimuli of a tangible and social nature.

The distinction between inward-directed and outward-directed behaviours is difficult to discern. All operant behaviours involve movement in the environment and so in this sense they are all outward-directed. The essence of the class of behaviours described as "self-stimulatory in nature" appears to be that these behaviours involve repetitive motor sequences that may be intrinsically reinforcing. However, one can only describe a behaviour as being intrinsically reinforced when one cannot identify sources of extrinsic reinforcement which maintain the response.

The most important consideration for the teacher or practitioner who encounters a child engaging in stereo-

typed acts is whether or not these movements interfere with the occurrence of more adaptive behaviour. For this reason, a more useful definition of stereotyped self-stimulatory behaviour would be high frequency, repetitive movements which can be shown to be functionally incompatible with more desirable responses. Such a definition would include the behaviour where a child continually throws his toys instead of playing with them.

Other Behavioural Approaches

Forehand and Baumeister (1976) identify three primary behaviour modification approaches that have been applied to self-stimulatory behaviour. The first involves presentation of positive reinforcement contingent upon either the nonoccurrence of the aberrant behaviour or the occurrence of some alternate activity. Foxx and Azrin (1973) note that these attempts have met with limited degrees of success. Guess and Rutherford (1967) were able to reduce self-stimulatory behaviour of retardates by about 50% by providing objects which could be manipulated. Mulhern and Baumeister (1969) reduced by one-third the rocking behaviour of two retardates by reinforcing the behaviour of sitting still. Baumeister and Forehand (1973) found that following the withdrawal of differential reinforcement for alternative behaviour, stereotyped responding reappeared at an even higher rate than that emitted during baseline. Miron and Rooney (1973) report a case where

a retarded individual exhibited such high rates of self-stimulation that there were few occassions in which more adaptive alternative behaviours could be differentially and reliably reinforced. Typically, procedures to differentially reinforce alternative behaviours have demonstrated little transfer or durability of effect (Forehand and Baumeister, 1976).

The second primary behaviour modification approach that has been applied to the problem of self-stimulation involves the removal of positive reinforcement following the occurrence of the repetitious behaviour. Methods that have been employed are (a) extinction by withholding social reinforcement, usually by ignoring the subject, (b) isolation or time out by removing the child from a reinforcing environment, and, (c) response cost by loss of a reinforcer.

The obvious difficulty of this approach is the fact that one cannot remove the reinforcing value which the stimulation carries on its own. That some positive results have been obtained by time out (Hamilton, Stephens, and Allen, 1967), isolation (Lovaas and Simmons, 1969), ignoring (Laws, Brown, Epstein, and Hocking, 1971), and response cost (Tate and Baroff, 1966) indicates that social reinforcers may play an important role in maintaining stereotypy. The approach suffers practical limitations when one considers the difficulty of preventing

all occassions of socially reinforcing stereotyped behaviours. Even a smile which is adventitiously paired with self-stimulation could be reinforcing.

Murphy, Nunes, and Hutchings-Ruprecht (1977) report an interesting study where stereotyped behaviour of two profoundly retarded students was controlled through the use of a procedure involving access to vibratory stimulation and its response contingent withdrawal. However, Forehand and Baumeister (1976) note that systematic analyses of the generalization and durability of behaviour change as a result of procedures where positive reinforcement has been removed have not been undertaken.

The third major behaviour modification approach that has been used to eliminate self-stimulation is punishment - the direct presentation of aversive stimulation contingent upon the occurrence of the aberrant behaviour (Holland and Skinner, 1961).

Electric shock is an aversive stimulus which has been frequently used in the treatment of stereotyped behaviours especially where individuals have engaged in self-destructive acts (Lovaas, Schaeffer, and Simmons, 1965; Tate and Baroff, 1966; Lovaas and Simmons, 1969; Merbaum, 1973; Wright, 1973). Shock has the advantage of being a quick and precise technique to administer which is highly aversive and has highly durable effects (Forehand and Baumeister, 1976). Drawbacks cited with the use of shock

are that it suppresses both behaviour in general and the targeted behaviour. It also lacks educative properties because it does not teach more adaptive responses (Judkins, 1976). Also, the effects of shock tend to be highly situation and trainer specific. It is often the case that social and legal constraints are imposed on the use of shock as a behaviour modification procedure.

Other aversive stimuli besides shock have been applied to decelerate stereotyped movements. Risley (1968) shouted at and shook a retarded girl contingent upon her body rocking and was able to effectively reduce the response. Baumeister and Forehand (1972) found a similar decrement in rocking using a contingent verbal command ("Stop rocking!") alone. They also applied .5-sec 75-dB white noise contingent upon body rocks but obtained no significant decline in the behaviour frequency. The conclusion made was that the human voice itself had some acquired punishing properties for the particular subjects used. Forehand and Baumeister (1976) suggest that a reasonable treatment program would involve conditioned avoidance training to vocal command. Additional aversive techniques which have been used include slaps on the thigh (Bucher and Lovaas, 1968), aromatic ammonia (Tanner and Zeiler, 1975), and hair tugs (Griffin, Locke and Landers, 1975).

Overcorrection

Overcorrection was first developed by Foxx and Azrin (1972) in the treatment of aggressive-disruptive behaviours of a brain damaged patient and two retarded patients. Its application involves components of each of the three major behaviour modification approaches which have been presented above. The general rationale underlying the use of overcorrection is twofold, and accordingly, there are two types of overcorrection procedures. The first, designated as restitution, consists of requiring a disruptor to restore the environmental consequences which his behaviour has had to a vastly improved state. For example, an individual who upset furniture might be required both to restore the furniture to its correct position and also to dust and wax it. The second type, positive practice, requires the disruptor to intensively practice overly correct forms of relevant behaviour. For example, the disruptor who upset the furniture would also be required to straighten and dust all other items of furniture in the room.

Self-stimulatory behaviours do not have environmentally disruptive consequences. Therefore, the restitutional overcorrection is not applicable. Positive practice overcorrection on the other hand, suppresses stereotyped responding by requiring the subject to practice correct forms of appropriate behaviour while simultaneously punishing

stereotyped acts.

The positive practice approach has been used in a number of situations as a method of reacting to disruptive conduct in a constructive manner or teaching new skills to replace old habits. Emotionally disturbed students who were disruptive in class were required to practice asking for permission to speak out or to leave their seats (Azrin and Powers, 1975). In toilet training normal children, the parent reacted to an "accident" by requiring the child to practice going to the potty (Azrin and Foxx, 1974). Similarly retarded adults practiced going to the toilet (Foxx and Azrin, 1973b). For aggression, the aggressor was required to practice functional arm movements (Ollendick and Matson, 1976). For agitative conduct the agitator was required to practice relaxation (Webster and Azrin, 1973). For habitual in-bed vomiting the person was required to practice hastening to the toilet area (Azrin and Wesolowski, 1975a). For self-injurious behaviour the person was required to practice relaxation or incompatible postures (Azrin, Gottlieb, Hughart, Wesolowski, and Rahn, 1975; Measel and Alfieri, 1976). For in-class masturbation the individual was required to practice alternative arm movements (Luiselli, Helfin, Pemberton, and Reisman, 1977). For nervous habits and tics the person was required to practice movements in opposite direction to the nervous habit (Azrin and Nunn, 1973). Positive

practice overcorrection has also been used as an avoidance procedure to increase the eye contact of autistic and retarted children (Foxx, 1977).

Azrin and Powers (1975) suggest that the connotation of vindictiveness which might result from the practice, may be minimized if the teacher explains to the student that the additional practice is being required only because the student has not yet learned the proper skill. They maintain that the re-educative, non-punitive spirit of the positive practice procedure may be its major advantage. Imposing penalties such as loss of recess might be viewed as a punitive desire to inconvenience the student and to cause him distress. This is not seen to be the case when the student is required to perform a task which is meaningfully related to the misbehaviour.

Critical Components of Positive Practice Overcorrection

Overcorrection procedures combine a number of factors which singly, or in combination, may be responsible for behaviour change (Foxx and Azrin, 1973). For the most part, the critical components of overcorrection have yet to be analyzed, and thus, the effectiveness of such procedures has been accounted for in theory only (Judkins, 1976). The operations which may be involved in positive practice include:

1) verbally telling the child that his behaviour is

inappropriate;

2) arranging aversive consequences for each occurrence of self-stimulation by requiring effortful and monotonous practice of an alternative behaviour;

3) time out from the reinforcing properties of the self-stimulation by immediately ceasing the behaviour when it occurs;

4) negatively reinforcing appropriate behaviour by removing positive practice and then returning the child to ongoing activity where he can engage in productive behaviours of a social or academic nature;

5) teaching an alternative behaviour during practice episodes which is likely to be reinforced in the child's everyday environment.

Treatment Effects

In a few studies where behaviours other than the target self-stimulatory acts were recorded, negative side-effects have accompanied overcorrection changes. Doke and Epstein (1975) observed a marked increase in new forms of self-stimulation when an overcorrection procedure was applied to the stereotypic object-mouthing behaviour of one child. Behaviours which increased included, rocking, head shaking, face-slapping, masturbating and eyelash pulling. Similarly Epstein et al. (1974) observed both desirable and undesirable side effects that

did not appear to be related to the practice required in overcorrection episodes. Inappropriate foot movements increased in frequency when overcorrection was utilized to suppress vocalizations in one of their subjects. The authors conclude that it would be difficult to attribute the treatment effects to the development of "positive practice" behaviours that physically competed with the problem behaviours.

Wells et al. (1977) attempted to test the idea further that intensive practice would teach and motivate more appropriate forms of behaviour. They obtained highly idiosyncratic results with twin subjects from the same home who were given the same overcorrection treatment. One twin was reported to display marked increases in the behaviour practiced during overcorrection, appropriate toy play. No increase in toy play was noted in the second twin until the behaviour was individually prompted and reinforced.

The data obtained by Wells et al. (1977) were interpreted as suggestive that positive practice overcorrection taught and motivated the increased occurrence of appropriate toy play in one of the twins. Presumably what they meant by "motivated" was that practice in the newly taught forms of play allowed the child to discover the reinforcing properties of toy play. The authors also mentioned the alternative possibility that the appropriate toy play

increased not as a direct result of positive practice but as a result of the suppression of stereotypic behaviour. Such covariation between rates of stereotypic behaviour and other more functional behaviour has been reported by others (Koegel et al., 1974; Risley, 1968). It is difficult to ascertain from the Wells et al. (1977) study to what extent positive practice was effective in motivating appropriate forms of behaviour when it is noted that the particular positive practice routine used at any one time depended on the play activity the child happened to be engaged in. Various positive practice routines were followed but there is no indication as to how often each particular routine was carried out. It could be that the particular play activity which the child favoured after overcorrection treatment was the activity with which there was least positive practice given.

It is not surprising that the child engaged in play of one form or another with the toys used in overcorrection since there were no alternative toys available other than those used in overcorrection. This condition plus the positive practice contingency for inappropriate toy play greatly restricted the child to positive interactions with the toys. The restriction may have had more to do with the observed increases in play than the routines practiced.

Response Class

Interpretation of the research by Wells et al. (1977) may have been made more clear if the various play behaviours had been recorded independently. In this way we would know what behaviours did or did not belong to the same response class.

Bijou and Baer (1967, p.78) define a response class as "... a group of responses which develop together. All grow trong or weak, even though the environment may be acting directly on only some of them." The context for this definition is taken from research by Baer and Sherman (1974). By reinforcing and extinguishing certain imitations they found that other imitations, though never reinforced, would increase and decrease in strength with the manipulated imitations.

Other investigators (Risley, 1968; Buell, Stoddard, Harris, and Baer, 1968; Barton, Guess, Garcia, and Baer, 1970) have observed covariations which suggest that member behaviours of a response class may also be inversely related (Sajwaj, Twardosz, and Burke, 1972). This led Sajwaj et al. (p.173) to redefine response class as "... a group of behaviours that covary directly and/or inversely, even though the environment acts directly on as few as one member behaviour." They suggest a functional approach to the identification of members of a response class since they found that predictions of changes in rates of behaviours

based on common sense or on similarities in behaviour typography may be quite misleading. A functional definition of a response class is obtained by manipulating a single behaviour and observing which other behaviours covary.

Historical Precedent

The idea that positive practice should be physically, structurally or functionally related to the behaviour being corrected stems from the early use of overcorrection with behaviours such as those involved in toilet training. Here, individuals were required to practice travelling to the toilet area, undressing and sitting on the toilet (Azrin and Foxx, 1971). These skills were necessary components of the desired goal "independent toileting." In addition to practicing this routine plus a restitution routine whenever there was an accident, the child was required to approach, undress, and sit on the toilet at regular intervals while he was dry. If during one of these latter episodes the individual eliminated while on the toilet then abundant reinforcement was provided. This reinforcement served to strengthen the chain of behaviours which preceded elimination.

It seems obvious that the positive practice routine, in the case of toilet training, teaches new functional behaviours. It is not obvious that the routine alone

increases the practiced behaviours in the future. The reinforcement provided for successful elimination is a confounding variable.

The notion that forced practice can increase further occurrence of those behaviours practiced is counter-intuitive. The aversive nature of the forced practice should make the behaviour practiced less probable. That this practice may teach new forms of behaviour is however, quite plausible.

Purpose of the Study

The question as to whether positive practice routines will increase the activity practiced outside of the practice episodes themselves is important. If it does increase, then ideally the behaviour alternative chosen for the positive practice routine should be one which is useful and likely to be maintained by naturally occurring reinforcers in the child's functional environment. On the other hand, if the aversive nature of positive practice decreases the frequency of occurrence of the behaviour, then the behaviour chosen for practice should not be a desirable behaviour such as play, rather, it should be some undesirable behaviour such as exaggerated arm movements. At the same time, new desirable behaviours should be taught so that by prompting and reinforcement, they may become

likely alternatives to the target self-stimulation.

The following study was designed to determine wheter or not a positive practice routine does in fact increase the frequency of the behaviours the child is forced to practice. Side effects of overcorrection on other behaviours which may belong to the same response classes as the behaviours treated or the behaviours practiced are analyzed. Another aim of the study was to validate further the use of the brief 2½ minute episodes of positive practice. This was the duration of practice used by Wells et al. (1977) to suppress self-stimulation.

It was hypothesized that as stereotyped behaviour became suppressed an increase would occur in appropriate play alternatives which were available but not practiced during positive practice overcorrection.

CHAPTER II

METHOD

Subjects

Three male children aged four and one half to five years who attended a preschool program for the developmentally handicapped served as subjects. Each of the children were being treated in the program for disorders of speech and language as well as a number of maladaptive behaviours which they displayed.

Staff in the program had identified the children used in the study as engaging in excessive amounts of self-stimulatory behaviour which interfered with daily program activities. Subject #1 continually bent his head from side to side which affected his balance when he walked and made it difficult for him to attend to instructions. Subject #2 engaged in a considerable amount of loud teeth grinding which was distracting for himself as well as other children and staff in the program. Subject #3 had a tendency to rub his hands and arms against his mouth to the point of causing chapped skin in these areas. He also tended to mouth educational materials and toys which were provided rather than working or playing appropriately with them. It was common to see this boy sit in the middle of the floor holding a toy at his mouth and making loud incomprehensible sounds while others played around him.

The teachers working with the children were anxious to receive information from the study which would be helpful to deal with the stereotyped mannerisms these children displayed at the expense of more appropriate interactions with educational materials. Each of the children's parents were also interested in finding out what could be done to bring the forms of self-stimulation under stimulus control and they were permitted to view the experimental sessions through a one way mirror which was located in the wall at the side of the playroom.

Intellectual testing which was carried out with the Stanford Binet Intelligence Scale (Form LM) prior to the beginning of experimental sessions yielded IQ's of 54, 59, and 59 for Subjects #1, #2, and #3 respectively. These scores placed the children's overall level of intellectual functioning, at the time of testing, within the mildly retarded (trainable) range of mental ability.

Setting and Apparatus

The experimental room was a large, well-lighted playroom measuring approximately seven meters by ten meters. The children were arranged on chairs around a small rectangular table at one end of the room, such that the play of each child could be video taped from the other end of the room.

A set of three toys was placed in front of each

child at the table. These included: (a) 16 small coloured balls with holes which fit onto a four post stand; there were four balls each of the colours red, blue, yellow, and green; (b) a small square, rubber form-board with 36 holes and a box of 50 three-inch pegs which could be stood into the holes in the board; each peg had a hole in one end through which a string could be threaded; and, (c) a cylinder board fitting 12 cylinders of various lengths and diameters.

The educational toys used were selected by program staff as being appropriate for the level of play of each of the children included. Each of the toys required a certain degree of eye-hand coordination to fit component parts into their holes. The children had not been taught to play correctly with the toys used before the study began, nor had they been given an opportunity to learn to play with these toys on their own.

The sound of a bell delivered by means of a tape recorder cued the beginning of each 10 second record and observation interval. The experimenter used a stop watch to time the episodes of overcorrection. Audiovisual recording equipment consisting of a VTR and a monitor were located behind a portable room divider at the end of the room opposite the children. At this end too the camera was situated on a tripod. A microphone was located on the ceiling directly over the childrens' heads.

Experimental sessions were conducted at nine oclock every morning when the children arrived by bus from their homes. After the session the children went into other treatment groups which were part of the regular preschool schedule. These other groups included training in gross motor activities, speech and language therapy, group games, and group play.

There were nine other children attending the program which ran Monday, Tuesday, Thursday, and Friday each week from nine in the morning until noon. The program was run by the Department of Psychology at the Glenrose Hospital in Edmonton. The eight member preschool teaching staff consisted of personnel from the departments of Psychology, Occupational Therapy, Speech Pathology, and Recreation. The staff were instructed not to respond to the behaviours which were being recorded in experimental sessions, in any other way than that which they usually responded prior to the study.

Measurement and Reliability

The children were observed together, typically four mornings per week, in the context of a half-hour free play session. Each session was subdivided into three eight-minute segments. Prior to each segment, one set of toys per child was arranged within each child's reach in order to maximize the accessibility of the various toys.

In between segments the experimenter required the children to exchange seats with one another. This was done to reduce the monotony of remaining seated in the same place for a full half hour.

Data were collected during 72 10-second intervals per session. These were terminated for any child while he was receiving overcorrection. A partial interval time sampling technique reported by Bijou, Peterson and Ault (1968) was utilized whereby the occurrence of target and non-target behaviours were recorded in alternating 10-second intervals: i.e., 10 seconds of observation was followed with 10 seconds for recording.

During the week prior to the beginning of experimental sessions, two observers were trained to a criterion of 95% total aggreement over the session for each of the target behaviours (those behaviours for which overcorrection was to occur) and play behaviours. One observer was an undergraduate volunteer and the other was a ward aid from the Glenrose Hospital.

Training sessions were carried out in the experimental setting and audiovisual taped recordings were made so that discrepancies in observations could be checked and behaviours redefined if necessary. These sessions were conducted in the experimental setting to allow the children's behaviour to habituate to the room, the audiovisual

equipment and the personnel present.

Reliability measures over a session were obtained during experimental conditions for the behaviours of one child at a time, on a non-random basis. Priority for reliability samples with any one subject depended upon the experimental phase in effect and the size of the interval since the last reliability check was taken. An attempt was made to sample inter-rater reliability on each child's behaviours as the experimental phases changed. Reliability was obtained by each of the observers recording the behaviours of two out of the three children so that simultaneous records were obtained for one child's behaviour throughout a session. Data on play behaviours was usually collected live, while data for inappropriate behaviours was collected by viewing the audiovisual recordings. Occassionally when an observer was absent for one reason or another, reliability was assessed by replaying the video tapes to obtain a second record.

Observers were not informed as to which child they were collecting reliability data on until after a given session ended, at which point feedback was provided in terms of total reliability for each of the child's behaviours. One of the observers was designated to be the main observer and her recordings were used as the primary source of data where simultaneous records were

obtained.

The recorded behaviours for each child were defined in the following manner:

Subject #1

Play Behaviours.

1. Ball Play --- Stacking coloured balls on wooden poles.

2. Peg Play --- Placing wooden pegs into the holes in the form board or stringing the pegs together that were already standing in the form board.

3. Cylinder Play --- Placing cylinders into the holes in the cylinder board.

Target Behaviours.

4. Headwags --- Rocking head from side to side in a vertical plane at any frequency of more than one rock in one 10 second record interval.

5. Throwing --- Using arms or hands to intentionally knock or throw materials across the table or onto the floor.

Other Inappropriate Behaviours.

6. Drumming --- Audible repetitious banging of materials or table top using hands, or, audible clapping of hands together.

Subject #2

Play Behaviours.

1. Ball Play --- (same as for Subject #1)

2. Peg Play --- (same as for Subject #1)

3. Cylinder Play --- (same as for Subject #1)

Target Behaviours.

4. Throwing --- (same as for Subject #1)

Other Inappropriate Behaviours.

5. Teeth Grinding --- Audible noises made by rubbing top teeth against bottom teeth.

6. Drumming --- (same as for Subject #1)

Subject #3

Play Behaviours.

1. Ball Play --- (same as for Subject #1)

2. Peg Play --- (same as for Subject #1)

3. Cylinder Play --- (same as for Subject #1)

Target Behaviours.

4. Mouthing --- Any finger, hand, toy, or object contact with the lips or mouth.

Other Inappropriate Behaviours.

5. Drumming --- (same as for Subject #1)

6. Screaming --- Loud unintelligible vocalizations.

Experimental Conditions

The children were observed in the context of a free play situation across all experimental conditions. They were allowed to interact toger or alone with the toys placed on the table in front of them. The experimenter and each observer were seated in different corners of the room and only the experimenter interacted with the child-

ren during treatment periods.

Baseline

During baseline conditions for a particular behaviour the experimenter did not respond to the occurrence of that behaviour.

Positive Practice

A positive practice overcorrection procedure used by Wells et al. (1977) was employed to engage the subjects in appropriate interaction with a particular toy contingent upon the occurrence of a target behaviour. When a specific target behaviour occurred the experimenter stood up and told the child in a neutral voice that he was not to do what he was doing (e.g. "No throwing John"). He then approached the child, physically stopped the inappropriate response, and then manually guided the child through 2.5 minutes of play with a specified toy. The experimenter would stand behind the child and hold each of the child's hands in his own while directing the play. Each child received overcorrection with one particular toy throughout the experiment and no two children were overcorrected with the same toy.

The actual play practiced with a toy was the same as that defined for each of the toys used. For ball play the child was required to stack the balls on wooden poles. For peg play the child was required to place the pegs into the form board holes. For cylinder play the child was required

to place cylinders into the correct holes in the cylinder board. When all items had been placed the experimenter disassembled the toy and required the child to start again.

Further attempts at inappropriate responding during the 2.5 minute period were physically stopped. If the child independently engaged in appropriate play manual guidance was faded out, as long as the child continued to play. Thus only by engaging in the required practice of appropriate toy play could the child avoid forced manual guidance during the 2.5 minute interval. Resistive behaviour such as crying or complaining during manual guidance was ignored by the experimenter as much as possible. The experimenter did not verbally interact with the child during positive practice.

Opposite Head Movements

On the seventh day of overcorrection for headwags with Subject #1 a new contingency was added to required play. For two sessions in a row Subject #1 was required to practice opposite head movements for two minutes followed by 30 seconds required play. Opposite head movements consisted of nodding the head forward and backward in a vertical plane and from side to side in a horizontal plane, as the experimenter directed. The instructions "head up...head down...head left...head right" were given in a varied order with one command every five seconds, and manual guidance with fading was

used in the same manner as in required play overcorrection. The opposite head movements contingency was added on day seven for ethical/clinical reasons which will be considered in the Discussion section.

Group Play Observations

Throughout the experiment the primary observer gathered probe data on the play behaviour of each child during a group play period which occurred in a different room one hour later in the day. Play behaviour was monitored here to ensure that overcorrection was not having adverse effects on the children's play outside of the experimental setting.

All three children were not usually present during these probes due to the individualized treatment schedules which each child had in the program. On any given day probe data was collected for 10 minutes on each of the children who happened to be present. Play behaviour was monitored using the same time sampling technique employed in experimental conditions. Only one child was monitored at a time and reliability data was gathered on ten occassions when the second observer could be present.

The group play period was held in a large play room where many varieties of toys were available. These included large and small building blocks, a large assortment of puzzles, a sandbox, toy cars and trucks, and a play house. The toys used in the experimental conditions

were also accessible to any child who wished to use them. There were usually six to eight children playing at this time and two or three adults were always present who helped the children get selected toys out to play with.

Behaviours observed for each of the subjects during group play probes included the following:

1. Toy Play --- Play with any of the types of toys used and defined for the experimental sessions.

2. Other Play --- Physical manipulation excluding throws with any toy other than that included in the toy play category.

Experimental Design

A multiple-baseline-across-subjects design was used to evaluate the effects of overcorrection on rates of play behaviour. Overcorrection was made contingent upon one inappropriate behaviour for one subject at a time.

The effects of overcorrection on rates of treated and non-treated inappropriate behaviours was evaluated by variations on an A-B design for each subject with multiple baseline comparisons being made on behaviours between and among subjects. Rates of non-treated inappropriate behaviours (drumming, screaming, and teeth-grinding) were monitored to assess the specificity of overcorrection in its treatment effects. The validity of observed treatment effects is increased when rates of non-treated behaviours

remain stable before and after the intervention has taken place. The particular non-treated, inappropriate behaviours recorded were selected because they were observed to occur often in pre-experimental sessions.

The following experimental phases were used:

1. Initial baseline - Five sessions for Subject #1, eight sessions for Subject #2, and eight sessions for Subject #3.

2. Positive practice play with pegs for Subject #1 contingent upon occurrences of headwags. Treatment began in Session Seven and lasted for eight sessions. The final two sessions included opposite head movements as well as required play.

3. Positive practice play with wooden balls for Subject #2 contingent upon occurrences of throwing materials. Treatment began in Session Nine and lasted 12 sessions. (Throwing was overcorrected because it was a serious distraction to the group and it could not be tolerated in the preschool treatment setting.)

4. Positive practice play with cylinders for Subject #3 contingent upon occurrences of mouthing. Treatment began in Session 15 and lasted for six sessions.

5. Positive practice play with pegs for Subject #1 contingent upon occurrences of throwing materials. Treatment began in Session 18 and lasted for two sessions.

CHAPTER III

RESULTS

Table 1 presents reliability data in terms of percentage agreement of occurrences of the behaviours recorded each session by the two observers. The formula which was used was:

$$R = \frac{A}{A + B} \times 100,$$

where "R" is the index of reliability expressed in terms of a percentage; "A" is the number of intervals where both observers marked an occurrence of the behaviour; and "B" is the number of intervals where either one of the observers marked an occurrence while the other did not.

Reliability in experimental sessions ranged from 0% to 100% with 100% being the modal value for each behaviour of all three subjects. The two reliability values of 0% for Subject #3 were obtained in sessions where the behaviours in question were observed to occur by one or the other observer in less than four out of the 72 record intervals.

Figure 1 presents percentages of occurrence of the behaviours treated by overcorrection with each subject, as well as the percentages of occurrence of the play behaviours practiced in overcorrection. Stereotyped head headwags decreased from a mean of 23% to a mean of 8% when positive practice was applied. The behaviour

Table 1

Percentage Reliability Between Observers for the Behaviour Occurrences of the Three Subjects Used

Behaviour of S#1

Session	Ball Play	Cyl. Play	Peg Play	Head-Wags	Drum-ming	Throw-ing
3	83	100	100	83	100	91
7	100	100	100	100	100	100
8	100	100	100	100	100	100
9	75	100	94	100	100	100
10	100	100	100	100	100	100
14	100	100	100	100	100	100
16	67	89	100	100	100	88

Behaviour of S#2

Session	Ball Play	Cyl. Play	Peg Play	Grind-ing	Drum-ming	Throw-ing
2	100	100	100	100	100	100
9	67	100	100	100	40	100
10	100	100	100	100	100	100
16	92	100	100	100	100	100
17	100	85	100	100	94	50

Behaviour of S#3

Session	Ball Play	Cyl. Play	Peg Play	Mouth ing	Drum-ming	Throw-ing	Scream-ing
1	80	97	84	80	100	100	100
4	89	100	76	100	100	89	87
5	100	100	100	100	93	97	88
15	100	100	100	100	100	100	100
16	0	88	0	100	67	75	100

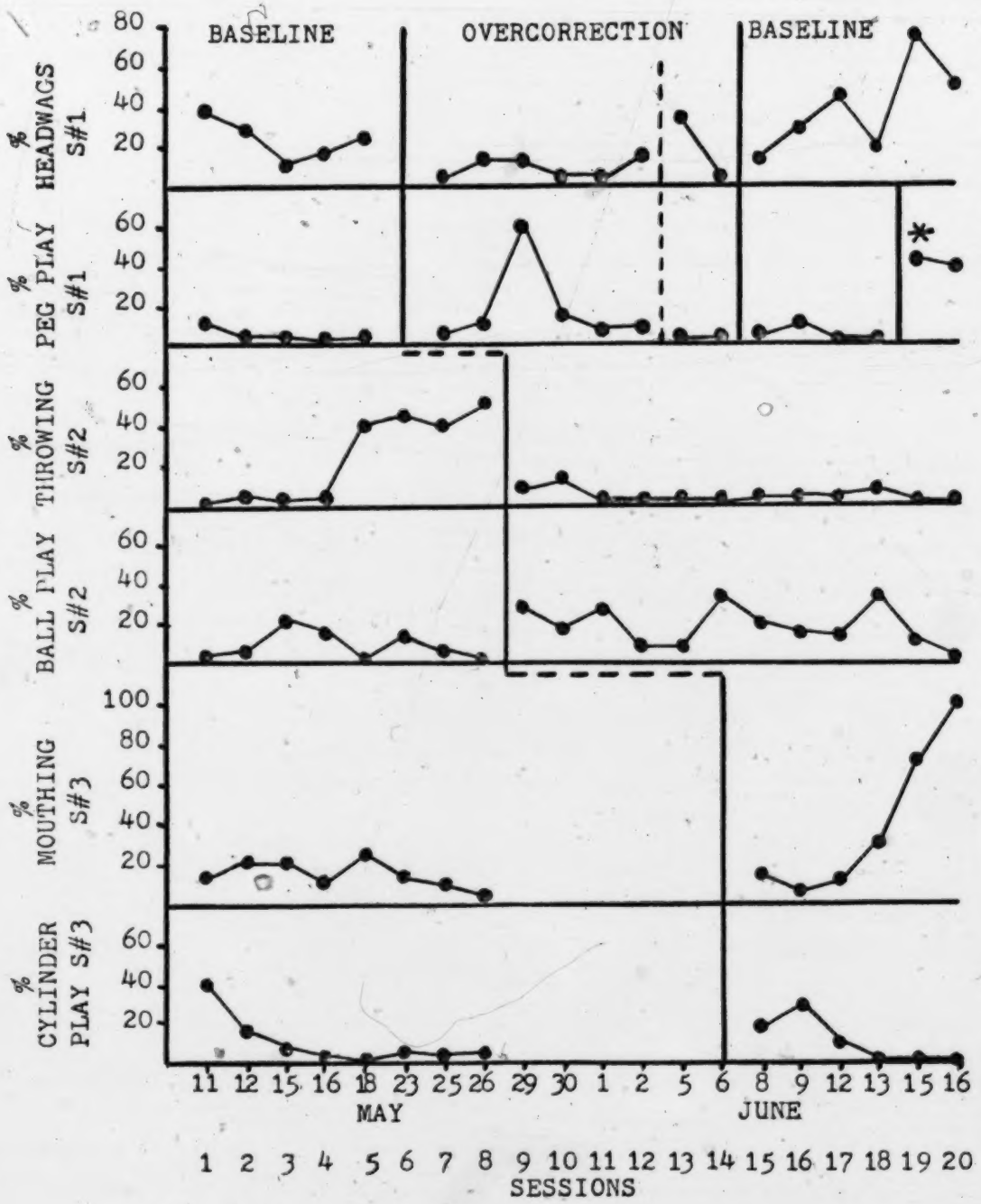
BASELINE
OVERCORRECTION
BASELINE
% HEADWAGS S#1
% PEG PLAY S#1
% THROWING S#2
% BALL PLAY S#2
% MOUTHING S#3
% CYLINDER PLAY S#3
*
11 12 15 16 18 23 25 26 29 30 1 2 5 6 8 9 12 13 15 16
MAY
JUNE
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
SESSIONS

Figure 1. Percent occurrence of headwags and peg play for Subject #1; throwing and ball play for Subject #2; and, mouthing and cylinder play for Subject #3. The solid vertical lines indicate introduction and withdrawal of overcorrection procedures. The dashed vertical line indicates the introduction of opposite head movements with required play overcorrection. Beginning in Session 19 (see asterik), Subject #1 received overcorrection with peg play for throwing.

practiced, peg play, showed a sporadic increase to a rate of 60% on the third day of overcorrection, but remained below 20% in subsequent treatment sessions for headwags.

The addition of opposite head movement practice in Session 13 for Subject #1 was marked with an initial increase in headwags followed by a near total suppression of this form of self-stimulation in Session 14. No occurrences of peg play were recorded in either of these sessions.

The withdrawal of positive practice from Sessions 15 through 18 was accompanied by rates of headwags comparable to the rates observed in the original baseline. When positive practice in peg play was made contingent on throwing with Subject #1, in the final two sessions, the rate of peg play increased sharply from 0% to a rate of 40%.

Throwing behaviour exhibited by Subject #2, which was observed to develop during baseline, showed an abrupt reduction from 40% to less than 5% when positive practice with ball play was initiated. Ball play itself tended to increase slightly during overcorrection.

For Subject #3 stereotyped mouthing showed a gradual increase after contingent positive practice was begun and a rate of 100% occurrence was reached on the sixth treatment session. Cylinder play, which was the form of play

practiced, showed an initial increase in level at the beginning of overcorrection but it gradually decreased as mouthing increased.

For all three subjects the level of play observed during positive practice overcorrection was sporadically higher than the stable levels reached during baseline.

Figures 2, 3, and 4 present percentages of occurrence of "other" behaviours displayed by Subjects #1, #2, and #3 respectively, in addition to those behaviours involved in overcorrection. The percentage of intervals spent in overcorrection is also presented.

In Sessions 19 and 20 of Figure 2 the throwing of Subject #1 decreased sharply from an upward trend when positive practice with peg play was made contingent on this behaviour. However, the rates of all of these "other" behaviours were fairly unstable and generally they appear unrelated to the presentation and withdrawal of overcorrection. The percentages of intervals spent in overcorrection for headwags also showed considerable variability and with the exception of the last day they tended to increase over the course of treatment.

In Figure 3 it can be seen that the rates of all three forms of play behaviour tended to increase after the onset of overcorrection. The rates of teeth grinding and drumming for Subject #2 appear to have been uneffected by positive practice. The percentage of intervals spent

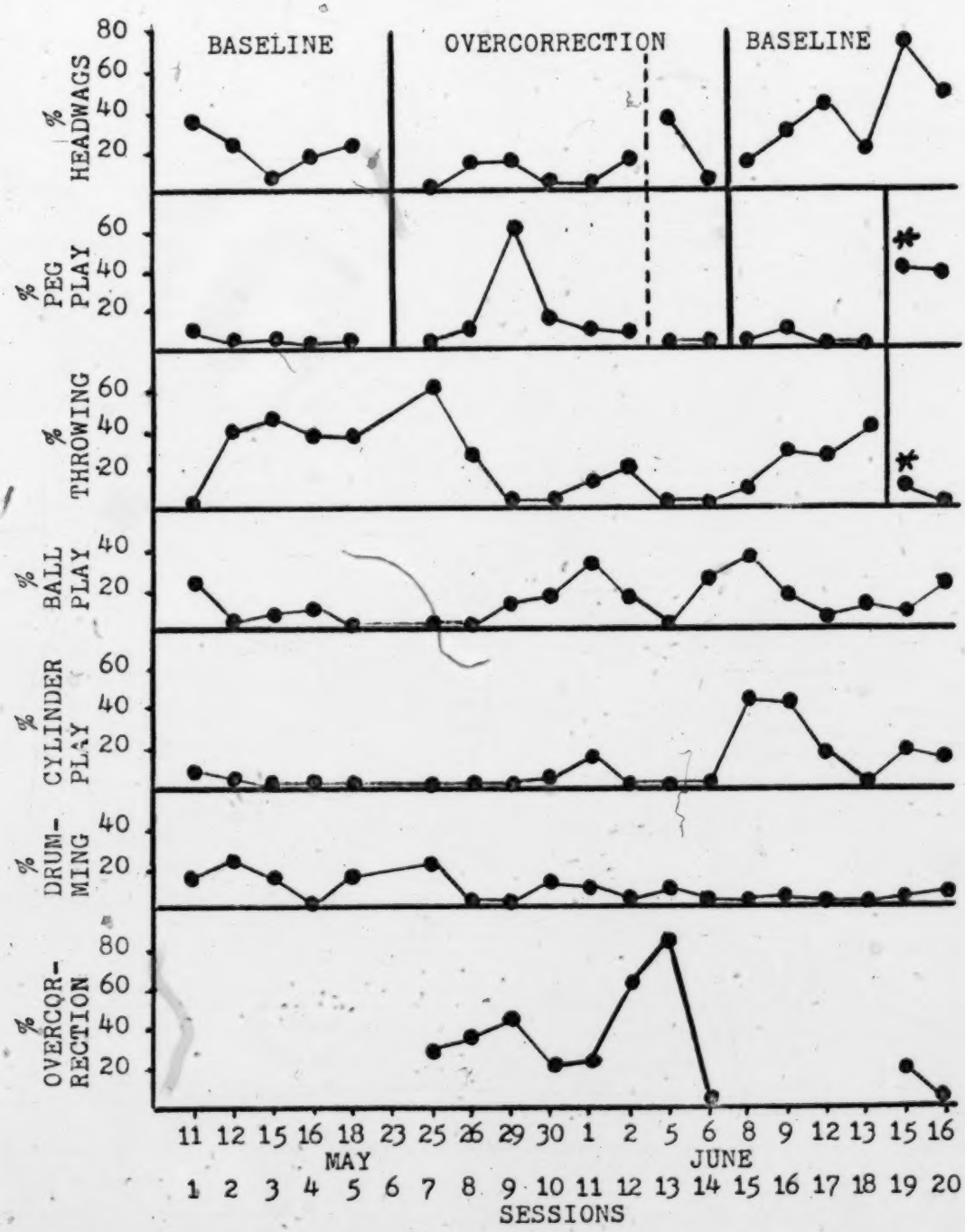

Figure 2. Percent occurrence for six behaviours and episodes of overcorrection for Subject #1. The solid vertical lines indicate introduction and withdrawal of peg play overcorrection for headwags. The dashed vertical line indicates the introduction of opposite head movements with required play overcorrection. Beginning in Session 19 (see asteriks) peg play overcorrection was made contingent upon throwing.

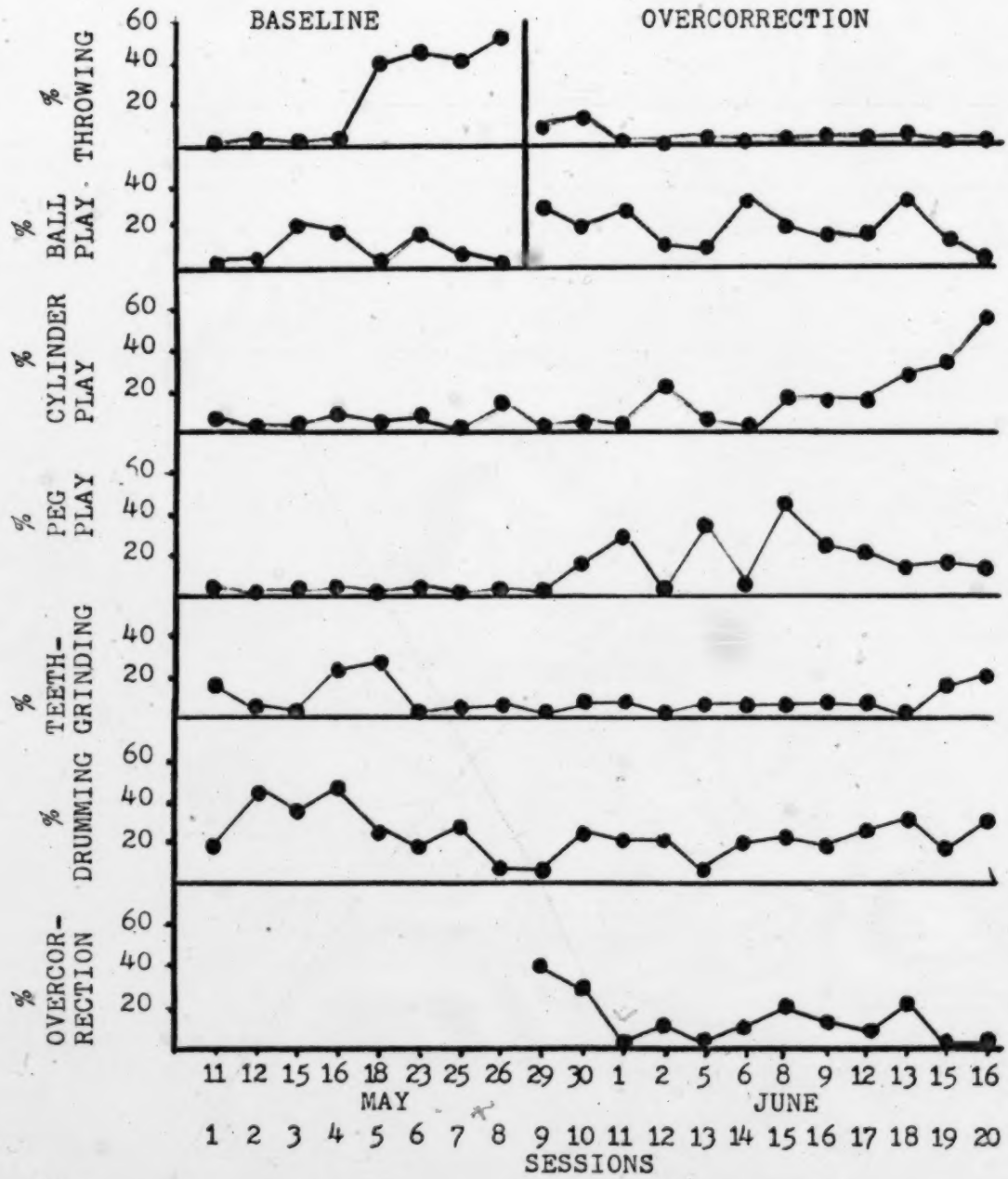

Figure 3. Percent occurrence for six behaviours and episodes of overcorrection for Subject #2. The solid vertical line indicates introduction and withdrawal of ball play overcorrection for throwing.

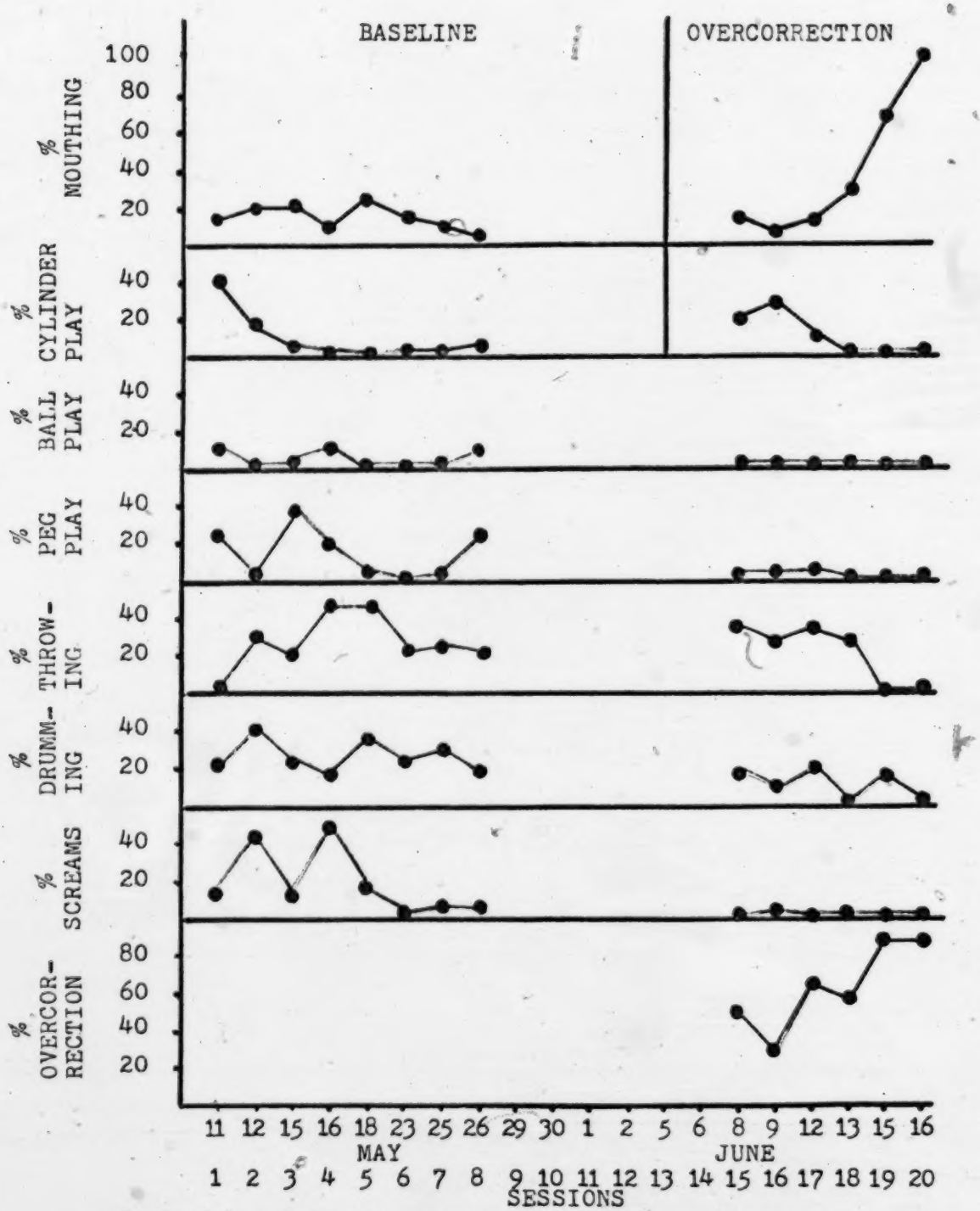

Figure 4. Percent occurrence for seven behaviours and episodes of overcorrection for Subject #3. The solid vertical line indicates introduction and withdrawal of cylinder play overcorrection for mouthing. Sessions without behaviour data were because of absence due to illness.

in overcorrection decreased over the first few sessions and remained at a relatively low rate throughout the remainder of treatment.

Figure 4 shows that the increased incidence of mouthing, by Subject #3, during overcorrection was accompanied by an eventual total suppression of the other behaviours observed. The behaviour practiced, cylinder play, was the only play behaviour which showed an initial increase during overcorrection from the stable level reached during baseline.

The rates of play behaviours observed during group play probes showed no changes as overcorrection was applied during treatment sessions. Table 2 indicates that each of the three subjects maintained relatively high rates of play with either the toys used in the experiment or the other toys which were available in the group play setting. Ten observation reliability checks which were made ranged from 67% to 100% using the same formula for agreement of occurrences which was employed during experimental sessions.

Table 2

Percentage Occurrences of Toy Play and Other Play for Subjects #1, #2, and #3 During Group Play Probes

Behaviour	Session Day[a]										
	5	7	9	10	11	13	14	16	17	18	19
Subject #1											
Toy Play	0	0	50	0 (100)[b]	0	0	0	0	0	37	70 (67)
Other Play	60	93	33	80 (96)	98	60	77	80	83	47	10 (95)

	Session Day														
	1	3	5	6	8	9	11	12	13	14	15	16	18	19	20
Subject #2															
Toy Play	0	42	23	0	0	8	0	37	0	0	0	0 (100)	37	30 (90)	67
Other Play	79	25	20	97	57	71	63	33	93	53	73	87 (81)	50	37 (83)	17

	Session Day										
	1	3	5	6	7	12	15	16	17	18	20
Subject #3											
Toy Play	0	0	0	3	0	0	0	0	0	0	0 (100)
Other Play	85	83	62	83	70	100	83	73	60	60	70 (95)

[a]Underlined Session Days indicate days when overcorection was being applied.

[b]Numbers in parentheses indicate reliability percentages for behaviour occurrences.

CHAPTER IV

DISCUSSION

Present findings failed to replicate the results obtained by Wells et al. (1977), where brief applications of required play effectively eliminated forms of stereotyped responding. Two and one half minute episodes of positive practice in appropriate toy play were not effective in substantially decreasing the rates of two self-stimulatory behaviours. Some decline was noted with stereotyped headwags while stereotyped mouthing in fact increased. Positive practice overcorrection did produce a sharp decrease in the throwing behaviour of two subjects. Throwing behaviour is a non-stereotyped, inappropriate response which was of low habit-strength for both subjects since it was observed to develop in the course of the study.

The multiple baseline design which was employed to assess the effects of positive practice on play behaviours clearly demonstrated that the practice routines used did not decrease the frequency of occurrence of the play required in overcorrection. Nor did required play make the particular forms used with each subject substantially increase. The forms of play practiced with each subject merely showed sporadic increases over rates maintained during baselines.

There are two alternative explanations possible for the sporadic increases in play which were observed. First, it may be the case that positive practice did teach forms

of play which the children found reinforcing initially, but lost interest with eventually due to satiation. Second, the children may have engaged in the forms of play required to avoid further episodes of manual guidance. Such avoidance behaviour would be maintained by negative reinforcement, which was essentially superstitious in nature, and, would continue only as long as it took the children to learn that other behaviour alternatives existed which would not be punished.

A few qualitative observations which were made during data collection support both notions of negative and positive reinforcement effects among the subjects treated. To begin with, Subject #2 was observed to guard the toy he was overcorrected with from the other children who attempted to take it for the purpose of throwing. When either of the other children reached for his toy he quickly took it out of their reach and hung onto it, even though he only played with it at a low rate. He also attempted to distract the children on a number of occassions, from trying to throw his toy by drumming on his desk and gesturing to them to do the same.

Subject #3 on the other hand appeared somewhat enthused with the cylinder play which he was required to practice. He became quite proficient at placing cylinders in their correct holes and he worked quickly to complete all the cylinders in his board. After a number of sessions

of overcorrection for mouthing, however, he began putting his hand to his mouth immediately when an episode of overcorrection ended so that the experimenter would stay and help him (with manual guidance) as he played. In the final session this child managed to keep positive practice overcorrection in cylinder play ongoing during 100% of the observation intervals.

Such qualitative observations were not made about the play of Subject #1. The sporadic increase in play during overcorrection did not even appear marked by any noticeable change in the rate of headwags. Because headwags were not substantially reduced by positive practice alone, this overcorrection contingency was changed in Sessions 13 and 14. During these two sessions Subject #1 was required to practice opposite head movements for two minutes folowed by 30 seconds of required play, for each occassion of stereotyped headwags.

The requirement of opposite head movements was not included in the interests of the experimental analysis for which this study was designed. Rather, this contingency was added because positive practice had failed to bring headwags under stimulus control and the experimenter had an ethical responsibility to try an alternative technique which has been used successfully elsewhere (Azrin et al., 1973). After two sessions opposite head movement practice was discontinued because this contingency had

the effect of suppressing all other behaviours as well.

The finding that required play did not make the particular forms practiced with each subject aversive and less probable is important information for teachers and clinicians in applied settings who may wish to use positive practice overcorrection. When a practice contingency is employed to reduce the frequency of an undesirable behaviour, the behaviour chosen for practice should be a useful alternative behaviour. Each episode of overcorrection is an opportunity to teach a better response. Increasing a child's repetoire of alternative behaviours expands his opportunity to come in contact with contingencies of reinforcement for such desirable behaviours.

It is interesting to note that the play behaviours which were not involved in overcorrection also showed sporadic increases with Subjects #1 and #2 after initial baseline periods for each child. Modelling effects are a likely explanation here as it can be observed that Subject #1 showed increased ball play and cylinder play beginning in the sessions corresponding with positive practice of these forms of play with Subjects #2 and #3. Subject #2 showed similar increases in play behaviours when Subjects #1 and #3 received positive practice. These results lend further support to the idea that the behaviours practiced during overcorrection should be functionally useful rather than functionally irrelevant.

The strong possibility of modelling effects with forms of play required in positive practice confounds the analysis of play behaviours for response class membership. It is not possible to discern to what extent increases in each of the play behaviours are due to class membership with the play practiced or, alternatively, modelling. Speculation would also include an interaction effect between these factors.

The failure of positive practice to generate substantial increases in the particular forms of play practiced only demonstrates that repetitious practice will not necessarily make an activity reinforcing. This fact is also instructive for the practitioner. An example of a more rigorous approach to encourage alternative behaviours has been described by Azrin et al. (1973) in the elimination of self-stimulation among institutionalized retarded adults. As well as contingent practice of opposing body movements for stereotypy a number of specific outward-directed activities were reinforced on a fixed interval schedule. Activites included separating blocks; placing pegs in peg boards; playing catch with a ball; assembling jigsaw puzzles; correctly pointing to pictures of different objects when asked; stringing multicoloured beads and blocks; and colouring in a colouring book. The teacher instructed the residents in a specified activity and then reinforced their participation with smiles, hugs,

praise and edibles. Furthermore, the conditions of reinforcement were carried out throughout most of the day.

The two and one half minute overcorrection interval in the present study proved to be too weak as a contingency for suppressing the self-stimulatory behaviours of the subjects used. Although short intervals of practice do increase the frequency by which the contingency can be applied, they also reduce the aversive qualities of effort and monotony which positive practice supplies. Differential results obtained between twins in the study by Wells et al. (1977), taken together with the weak influences of brief practice episodes found in the present study, indicates that the magnitude of the effects varies considerably from one subject to the next. There does not seem to be a generally recommendable amount of overcorrection which will produce a maximally expedient treatment effect. Research is needed to determine whether one should begin treatment with practice episodes of large or small duration and whether or not these durations should be varied in some way over the course of treatment.

The Issue of Statistics

Statistical analyses have not been carried out on the data obtained in this study. Currently in applied behavioural research there is a controversy concerning whether or not inferential statistical tests should be

employed in the determination of experimental significance where N=1 research designs are used (Kratochwill and Brody, 1978). "Experimental significance" refers to the reliability of a behavioural change which has been produced by the manipulation of one or more independent variables. The following discussion summarizes some of the major issues involved in the controversy about statistics. Based on these issues a set of guidelines for the use of statistics in single subject research will be presented, which are relevant to the absence of statistics in the present study.

Reliability in single-case research is usually determined by visual inspection of data from treatment effects which have been replicated over time (Kazdin, 1978). Supporters of non-statistical research methodologies contend that single subject designs have, in the absence of statistical analyses, been responsible for nothing less than a technology of behaviour (Baer, 1977a). Skinner (1972, p.319) even contends that, "We owe most of our scientific knowledge to methods of inquiry which have never been formally analyzed or expressed in normative rules."

Furthermore, applied behaviour analysis is said to be a deliberate departure from the tradition in psychology which seeks to detect all functional variables and their interactions as the prime goal (Baer, 1977b). Instead,

the discovery of only those variables which are obviously important in producing substantial amounts of desirable behaviour change is sought. The importance of a change which has been achieved is referred to as "clinical significance."

Baer (1977a) has pointed out that statistical analyses in applied behavioural research would allow experimenters to tease out small unimportant changes in behaviour with quantifiable estimates of confidence. He cautions that if statistical significance is used as a prime criterion in assessing the value of research studies, then the present technology of behaviour with its robust variables will weaken and become highly academic, and, less useful to the clinician.

In a similar vein Michael (1974) has warned that statistical control reduces the necessity of developing experimental control. In fact statistical control may interfere with experimental control, since, to satisfy statistical requirements an experiment must be carried out in an inflexible manner despite variability which may enter the data. In non-statistical analyses it is usually possible to change the procedure while the experiment is under way. Uncontrolled variability in the dependent variables is a situation which calls for more effective experimentation, not a more complex statistical manipulation of the data.

Supporters of statistical methods of inquiry have retorted that visual analysis which operant psychologists rely on involves a component of "inference" which may be a source of unreliability in a graphical analysis (Jones, Vaught, and Reid, 1975). Several authors (Deprospero, Cohen, Kennen, and Edelstein, 1975; Glass, Willson, and Gottman, 1975; Jones et al., 1975; Jones, Vaught, and Weinrott, 1977) have documented erroneous conclusions which have been made by researchers in judging N=1 data through visual analysis. Recently, it has been suggested that visual inference about changes in scores in an N=1 experiment involves statistical concepts. These include variability, overlap, numbers of scores, and autocorrelation (Jones et al., 1977). Hence, statistical properties of behavioural data form the basis for visual analysis (Kratochwill and Brody, 1978).

The controversy, as it stands, certainly leaves the experimenter in applied behaviour analysis in a quandary about whether or when he should use statistics in his work. Some guidelines, based on the evidence, will now be offered which are relevant to the present study as well as the further pursuit of research in the area of positive practice.

In the first place, because applied behaviour analysis is a technology which seeks to uncover robust variables, statistical tests should not be used when graphic analysis

indicates that the independent variables manipulated are weak in effect. Clinical significance must remain as the prime criterion of research importance.

Second, experimenters must not allow considerations of statistical inquiry to force them to become rigid in experimental procedure before sources of variability have been substantially reduced in the data. The early stages of most research should be non-statistical for this reason.

Third, when an experimenter has been able to control extraneous sources of variability and believes that he has discovered a clinically significant factor in the control of a socially important behaviour, he must set out to objectively prove his belief. Scientific validation in single-subject research will be best accomplished by a design which accomodates statistical analyses. Statistical analyses are the highest level of objective proof but they are a waste of time and effort when applied to weak and unimportant variables which may have influenced behaviour.

In light of these guidelines more experimentation is in order before statistical procedures would be called for to validate the results obtained. The positive practice routines need to be improved so that they become more effective in reducing stereotyped responses and increasing the rates of more appropriate behaviours.

Regardless of what statistical measures would be obtained on the data presented, this research conclusively shows that the overcorrection procedure that was employed did not produce robust treatment effects.

REFERENCES

Azrin, N. H., & Foxx, R. M. A rapid method of toilet training the institutionalized retarded. Journal of Applied Behavior Analysis, 1971, 4, 89-99.

Azrin, N. H., & Foxx, R. M. Toilet training in less than a day. New York: Simon and Schuster, 1974.

Azrin, N. H., Gottlieb, L., Hughart, L., Wesolowski, M., & Rahn, T. Eliminating self-injurious behavior by educative procedures. Behavior Research and Therapy, 1975, 13, 101-111.

Azrin, N. H., Kaplan, S. J., & Foxx, R. M. Autism reversal: Eliminating stereotyped self-stimulation of retarded individuals. American Journal of Mental Deficiency, 1973, 78, 241-248.

Azrin, N. H., & Nunn, A. G. Habit reversal: A method of eliminating nervous habits and tics. Behavior Research and Therapy, 1973, 11, 619-628.

Azrin, N. H. & Powers, M. A. Eliminating classroom disturbances of emotionally disturbed children by positive practice procedures. Behavior Therapy, 1975, 6, 525-534.

Azrin, N. H., & Wesolowski, M. D. Eliminating habitual vomiting in a retarded adult by positive practice and self correction. Journal of Behavior Therapy and Experimental Psychiatry, 1975, 6, 145-148.

Baer, D. M. "Perhaps it would be better not to know everything." Journal of Applied Behavior Analysis, 1977, 10, 167-172. (a)

Baer, D. M. Reviewer's comment: Just because it's reliable doesn't mean that you can use it. Journal of Applied Behavior Analysis, 1977, 10, 117-119. (b)

Baer, D. M., & Sherman, J. A. Reinforcement control of generalized imitation in young children. Journal of Experimental Child Psychology, 1964, 1, 37-49.

Barton, E. P., Guess, D., Garcia, E., & Baer, D. M. Improvement of retardates mealtime behaviors by timeout procedures using multiple baseline techniques. Journal of Applied Behavior Analysis, 1970, 3, 77-84.

Baumeister, A. A., & Forehand, R. Effects of contingent shock and verbal command on body rocking of retardates. Journal of Clinical Psychology, 1972, 28, 586-590.

Baumeister, A. A., & Forehand, R. Stereotyped acts. In N. R. Ellis (Ed.), International review of research in mental retardation. (Vol. 6). New York: Academic Press, 1973, 55-96.

Berkson, G. Abnormal stereotyped motor acts. In J. Zubin and H. F. Hunt (Eds.), Comparative psychopathology - Animal and Human. New York: Grune and Stratton, 1967, 76-94.

Berkson, G., & Davenport, R. K. Stereotyped movements in mental defectives: I. Initial survey. American

Journal of Mental Deficiency, 1962, 66, 849-852.

Berkson, G., & Mason, W. Stereotyped behaviors of chimpanzees: relation to general arousal and alternative activities. Perceptual and Motor Skills, 1964, 19, 635-652. (a)

Berkson, G., & Mason, W. Stereotyped movements of mental defectives: IV. The effect of toys and the character of the acts. American Journal of Mental Deficiency, 1964, 68, 511-524. (b)

Berlyne, D. E. Conflict, arousal, and curiosity. New York: McGraw-Hill, 1960.

Bijou, S. W., & Baer, D. M. Editor's comments for D. M. Baer, and J. A. Sherman. Reinforcement control of generalized imitation in young children. In Child Development: Readings in Experimental Analysis. New York: Appleton Century-Crofts, 1967, 78-79.

Bijou, S. W., Peterson, R. F., and Ault, M. H. A method to integrate descriptive and experimental field studies at the level of data and empirical concepts. Journal of Applied Behavior Analysis, 1968, 1, 175-191.

Brody, S. Self-rocking in infancy. Journal of the American Psychoanalytic Society, 1960, 8, 464-491.

Bucher, B., & Lovaas, O. I. Use of aversive stimulation in behavior modification. In M. R. Jones (Ed.), Miami symposium on the prediction of behavior. 1967: Aversive stimulation. Coral Gables: University of Miami Press,

1968.

Buell, J., Stoddard, P., Harris, F. R., & Baer, D. M. Collateral social development accompanying reinforcement of outdoor play in a preschool child. Journal of Applied Behavior Analysis, 1968, 1, 167-173.

Campbell, C. M. Stereotyped and expressive movements in imbeciles. American Journal of Mental Deficiency, 1968, 73, 187-194.

Cleland, C. C., & Clark, C. M. Sensory deprivation and aberrant behavior among idiots. American Journal of Mental Deficiency, 1966, 71, 213-225.

DeProspero, A. J., Cohen, S. H., Kennen, R. D., & Edelstein, B. M. Objective approach to visual inspection of intrasubject replication data. Paper presented at the 83rd Annual Convention of the American Psychological Association, Chicago, August 30, 1975.

Doke, L. A., & Epstein, L. H. Oral overcorrection: Side effects and extended applications. Journal of Experimental Child Psychology, 1975, 20, 496-511.

Epstein, L. H., Doke, L. A., Sajwaj, T., Sorrell, S., & Rimmer, B. Generality and side effects of overcorrection. Journal of Applied Behavior Analysis, 1976, 9, 471-482.

Forehand, R., & Baumeister, A. A. Deceleration of aberrant behavior among retarded individuals. In

M. Hersen, R. M. Eisler and P. M. Miller (Eds.), Progress in behavior modification. (Vol. 2), New York: Academic Press, 1976, 223-278.

Foxx, R. M. Attention training: The use of overcorrection avoidance to increase the eye contact of autistic and retarded children. Journal of Applied Behavior Analysis, 1977, 10, 489-499.

Foxx, R. M., & Azrin, N. H. Restitution: A method of eliminating aggressive-disruptive behaviors of retarded and brain damaged patients. Behavior Research and Therapy, 1972, 10, 15-27.

Foxx, R. M., & Azrin, N. H. The elimination of autistic self-stimulatory behavior by overcorrection. Journal of Applied Behavior Analysis, 1973, 6, 1-14. (a)

Foxx, R. M., & Azrin, N. H. Toilet training the retarded: A rapid program for day and nighttime independent toileting. Champaign, IL: Research Press, 1973. (b)

Gerard, M. The emotionally disturbed child. New York: Child Welfare League of America, 1957.

Gesell, A., & Armatruda, C. S. Developmental diagnosis. New York: Paul B. Hoeber, 1941.

Glass, G. V., Willson, J., & Gottman, J. M. Design and analysis of time series experiments. Boulder: University of Colorado Press, 1975.

Griffin, J. C., Locke, B. J., & Landers, W. F. Manipulation of potential punishment parameters in the

treatment of self-injury. Journal of Applied Behavior Analysis, 1975, 8, 458-468.

Guess, D., & Rutherford, G. Experimental attempts to reduce stereotyping among blind retardates. American Journal of Mental Deficiency. 1967, 71, 984-986.

Hamilton, J, W., Stephens, L., & Allen, P. Controlling aggressive and destructive behavior in severely retarded institutionalized residents. American Journal of Mental Deficiency, 1967, 71, 852-856.

Holland, J. G., & Skinner, B. F. The analysis of behavior. New York: McGraw-Hill, 1961.

Hollis, J. H. The effects of social and nonsocial stimuli on the behavior of profoundly retarded children: Part I. American Journal of Mental Deficiency, 1965, 69, 755-771.

Hollis, J. H. Body-rocking: Effects of sound and reinforcement. American Journal of Mental Deficiency, 1971, 75, 642-644.

Hutt, C., & Hutt, S. J. Effects of environmental complexity on stereotyped behaviors of children. Animal Behavior, 1965, 13, 1-4.

Ilg, F. L., & Ames, L. B. Child Behavior. New York: Harper, 1955.

Jones, R. R., Vaught, R. S., & Reid, J. B. Time series analysis as a substitute for single subject analysis of variance designs. In G. R. Patterson, I. M. Marks,

J. D. Matarazzo, R. A. Meyers, G. E. Schwartz, and H. H. Stupp, Behavior Change 1974. Chicago: Aldine, 1975.

Jones, R. R., Vaught, R. S., & Weinrott, M. Time-series analysis in operant research. Journal of Applied Behavior Analysis, 1977, 10, 151-166.

Judkins, J. D. Overcorrection procedures with the institutionalized retarded: An evaluative review. Mental Retardation Bulletin, 1976, 2, 98-110.

Kaufman, M. E. The effects of institutionalization on development of stereotyped and social behaviors in mental defectives. American Journal of Mental Deficiency, 1967, 71, 581-585.

Kaufman, M. E., & Levitt, H. A study of three stereotyped behaviors in institutionalized mental defectives. American Journal of Mental Deficiency, 1965, 69, 467-473.

Kazdin, A. E. Methodological and interpretive problems of single case experimental designs. Journal of Consulting and Clinical Psychology, 1978, 46, 629-642.

Klaber, M. M., & Butterfield, E. C. Stereotyped rocking: A measure of institution and ward effectiveness. American Journal of Mental Deficiency, 1968, 73, 13-20.

Koegel, R. L., & Covert, A. The relationship of self-stimulation to learning in autistic children. Journal of Applied Behavior Analysis, 1972, 5, 381-387.

Koegel, R. L., Firestone, P. B., Kramme, K. W., & Dunlop, G. Increasing spontaneous play by suppressing self-stimulation in autistic children. Journal of Applied Behavior Analysis, 1974, 7, 521-528.

Kratochwill, T. R., & Brody, G. H. Single subject designs: A perspective on the controversy over employing statistical inference and implications for research and training in behavior modification. Behavior Modification, 1978, 2, 291-307.

Kulka, A., Fry, C., & Goldstein, F. J. Kinesthetic needs in infancy. American Journal of Orthopsychiatry, 1960, 30, 562-571.

Laws, D. R., Brown, R. A., Epstein, J., & Hocking, N. Reduction of inappropriate social behavior in disturbed children by an untrained paraprofessional therapist. Behavior Therapy, 1971, 2, 519-533.

Leuba, C. Toward some integration of learning theories: The concept of optimal stimulation. Psychological Reports. 1955, 1, 27-32.

Levy, D. M. On the problem of movement restraint. American Journal of Orthopsychiatry, 1944, 14, 644-671.

Lourie, R. S. The role of rhythmic patterns in childhood. American Journal of Psychiatry, 1959, 105, 653-660.

Lovaas, O. I., Litrownik, A., & Mann, R. Response latencies to auditory stimuli in autistic children engaged in self-stimulatory behavior. Behavior

Research and Therapy, 1971, 9, 39-49.

Lovaas, O, I., Schaeffer, B., & Simmons, J. Q. Building social behavior in autistic children by the use of electric shock. Journal of Experimental Research in Personality, 1965, 1, 99-109.

Lovaas, O. I., & Simmons, J. Q. Manipulation of self-destruction in three retarded children. Journal of Applied Behavior Analysis, 1969, 2, 143-157.

Luiselli, J. K., Helfen, C. S., Pemberton, B. W., & Reisman, J. The elimination of a child's in-class masturbation by overcorrection and reinforcement. Journal of Behavior Therapy and Experimental Psychiatry, 1977, 8, 201-204.

Measel, C. J., & Alfieri, P. A. Treatment of self-injurious behavior by a combination of reinforcement for incompatible behavior and overcorrection. American Journal of Mental Deficiency, 1976, 81, 147-153.

Merbaum, M. The modification of self-destructive behavior by a mother-therapist using aversive stimulation. Behavior Therapy. 1973, 4, 442-447.

Michael, J. Statistical inference for individual organism research: Mixed blessing or curse. Journal of Applied Behavior Analysis, 1974, 7, 647-653.

Miron, N. B., & Rooney, J. R. The accidental acquisition of stimulus control during the extinction of self-

injurious behavior in severely retarded children. Unpublished manuscript, Sonoma State Hospital (California), 1973.

Mulhern, T., & Baumeister, A. A. An experimental attempt to reduce stereotypy by reinforcement procedures. American Journal of Mental Deficiency, 1969, 74, 69-74.

Murphy, R. J., Nunes, D. L., & Hutchings-Ruprecht, M. Reduction of stereotyped behavior in profoundly retarded individuals. American Journal of Mental Deficiency, 1977, 82, 238-245.

Ollendick, T. H., & Matson, J. L. An initial investigation into the parameters of overcorrection. Psychological Reports, 1976, 39, 1139-1142.

Rimland, R. Infantile autism. New York: Appleton-Century-Crofts, 1964.

Risley, T. R. The effects and side effects of punishing the autistic behaviors of a deviant child. Journal of Applied Behavior Analysis, 1968, 1, 21-34.

Sajwaj, T., Twardosz, S., & Burke, M. Side effects of extinction procedures in a remedial preschool. Journal of Applied Behavior Analysis, 1972, 5, 163-175.

Skinner, B. F. Cumulative Record (3rd ed.). New York: Appleton-Century-Crofts, 1972.

Spradlin, J. E., & Girardeau, F. L. The behavior of moderately and severely retarded persons. In N. R. Ellis (Ed.), International review of research in

mental retardation (Vol. 1). Mew York: Academic Press, 1966.

Tate, B. G., & Baroff, G. S. Aversive control of self-injurious behavior in a psychotic boy. Behavior Research and Therapy, 1966, 4, 281-287.

Tanner, B. A., & Zeiler, M. Punishment of self-injurious behavior using aromatic ammonia as the aversive stimulus. Journal of Applied Behavior Analysis, 1975, 8, 53-57.

Webster, D. R., & Azrin, N. H. Required relaxation: A method of inhibiting agitative-disruptive behavior of retardates. Behavior Research and Therapy, 1973, 11, 67-78.

Wells, K. C., Forehand, R., Hickey, K., & Green, K. D. Effects of a procedure derived from the overcorrection principle on manipulated and nonmanipulated behaviors. Journal of Applied Behavior Analysis, 1977, 10, 679-687.

Wright, L. Aversive conditioning of self-induced seizures. Behavior Therapy, 1973, 4, 712-713.

APPENDIX A

RAW DATA

Total Behaviour Occurrences Per Session Expressed as a Fraction of Total Number of 10-second Observation Intervals Used

SUBJECT #1

DATE	BEHAVIOUR						
May	Ball Play	Cylinder Play	Peg Play	Head-Wags	Drum-ming	Throw-ing	
11	$\frac{17}{72}$	$\frac{9}{72}$	$\frac{9}{72}$	$\frac{28}{72}$	$\frac{11}{72}$	$\frac{0}{72}$	
12	$\frac{4}{72}$	$\frac{3}{72}$	$\frac{1}{72}$	$\frac{20}{72}$	$\frac{18}{72}$	$\frac{27}{72}$	
15	$\frac{6}{72}$	$\frac{1}{72}$	$\frac{1}{72}$	$\frac{6}{72}$	$\frac{10}{72}$	$\frac{31}{72}$	
16	$\frac{7}{72}$	$\frac{1}{72}$	$\frac{0}{72}$	$\frac{12}{72}$	$\frac{2}{72}$	$\frac{26}{72}$	
18	$\frac{1}{72}$	$\frac{2}{72}$	$\frac{1}{72}$	$\frac{17}{72}$	$\frac{10}{72}$	$\frac{27}{72}$	Overcor-rection
25	$\frac{0}{49}$	$\frac{0}{49}$	$\frac{1}{49}$	$\frac{1}{49}$	$\frac{6}{49}$	$\frac{30}{49}$	$\frac{23}{72}$
26	$\frac{1}{47}$	$\frac{1}{47}$	$\frac{5}{47}$	$\frac{6}{49}$	$\frac{0}{47}$	$\frac{15}{47}$	$\frac{26}{72}$
29	$\frac{3}{25}$	$\frac{0}{25}$	$\frac{15}{25}$	$\frac{3}{25}$	$\frac{0}{25}$	$\frac{1}{25}$	$\frac{23}{48}$
30	$\frac{8}{57}$	$\frac{3}{57}$	$\frac{8}{57}$	$\frac{2}{57}$	$\frac{6}{57}$	$\frac{3}{57}$	$\frac{15}{72}$
June 1	$\frac{20}{55}$	$\frac{8}{55}$	$\frac{3}{55}$	$\frac{2}{55}$	$\frac{6}{55}$	$\frac{6}{55}$	$\frac{17}{72}$

June

2	$\frac{4}{25}$	$\frac{0}{25}$	$\frac{2}{25}$	$\frac{4}{25}$	$\frac{1}{25}$	$\frac{5}{25}$	$\frac{47}{72}$
5	$\frac{0}{11}$	$\frac{0}{11}$	$\frac{0}{11}$	$\frac{4}{11}$	$\frac{1}{11}$	$\frac{0}{11}$	$\frac{61}{72}$
6	$\frac{15}{64}$	$\frac{1}{64}$	$\frac{0}{64}$	$\frac{1}{64}$	$\frac{3}{64}$	$\frac{0}{64}$	$\frac{8}{72}$
8	$\frac{26}{72}$	$\frac{34}{72}$	$\frac{1}{72}$	$\frac{10}{72}$	$\frac{0}{72}$	$\frac{7}{72}$	
9	$\frac{10}{72}$	$\frac{34}{72}$	$\frac{7}{72}$	$\frac{20}{72}$	$\frac{2}{72}$	$\frac{21}{72}$	
12	$\frac{4}{72}$	$\frac{5}{72}$	$\frac{0}{72}$	$\frac{32}{72}$	$\frac{0}{72}$	$\frac{18}{72}$	
13	$\frac{5}{48}$	$\frac{3}{48}$	$\frac{0}{48}$	$\frac{13}{48}$	$\frac{0}{48}$	$\frac{36}{48}$	
15	$\frac{3}{57}$	$\frac{10}{57}$	$\frac{24}{57}$	$\frac{43}{57}$	$\frac{2}{57}$	$\frac{4}{57}$	$\frac{15}{72}$
16	$\frac{15}{66}$	$\frac{10}{66}$	$\frac{25}{66}$	$\frac{33}{66}$	$\frac{5}{66}$	$\frac{2}{66}$	$\frac{6}{72}$

SUBJECT #2

DATE	BEHAVIOUR					
May	Ball Play	Cylinder Play	Peg Play	Grinding	Drumming	Throwing
11	$\frac{2}{72}$	$\frac{6}{72}$	$\frac{2}{72}$	$\frac{12}{72}$	$\frac{12}{72}$	$\frac{0}{72}$
12	$\frac{4}{72}$	$\frac{0}{72}$	$\frac{1}{72}$	$\frac{3}{72}$	$\frac{33}{72}$	$\frac{5}{72}$
15	$\frac{16}{72}$	$\frac{3}{72}$	$\frac{2}{72}$	$\frac{3}{72}$	$\frac{25}{72}$	$\frac{0}{72}$
16	$\frac{12}{72}$	$\frac{7}{72}$	$\frac{5}{72}$	$\frac{17}{72}$	$\frac{35}{72}$	$\frac{3}{72}$

May							
18	$\frac{0}{72}$	$\frac{2}{72}$	$\frac{1}{72}$	$\frac{18}{72}$	$\frac{17}{72}$	$\frac{29}{72}$	
23	$\frac{11}{72}$	$\frac{5}{72}$	$\frac{2}{72}$	$\frac{0}{72}$	$\frac{13}{72}$	$\frac{33}{72}$	
25	$\frac{4}{72}$	$\frac{1}{72}$	$\frac{0}{72}$	$\frac{2}{72}$	$\frac{22}{72}$	$\frac{28}{72}$	
26	$\frac{0}{72}$	$\frac{11}{72}$	$\frac{2}{72}$	$\frac{4}{72}$	$\frac{4}{72}$	$\frac{35}{72}$	Overcor-rection
29	$\frac{9}{28}$	$\frac{0}{28}$	$\frac{0}{28}$	$\frac{0}{28}$	$\frac{2}{28}$	$\frac{2}{28}$	$\frac{20}{48}$
30	$\frac{9}{49}$	$\frac{3}{49}$	$\frac{8}{49}$	$\frac{1}{49}$	$\frac{13}{49}$	$\frac{4}{49}$	$\frac{23}{72}$
June							
1	$\frac{20}{72}$	$\frac{6}{72}$	$\frac{20}{72}$	$\frac{5}{72}$	$\frac{15}{72}$	$\frac{0}{72}$	$\frac{0}{72}$
2	$\frac{5}{64}$	$\frac{15}{64}$	$\frac{1}{64}$	$\frac{0}{64}$	$\frac{13}{64}$	$\frac{0}{64}$	$\frac{8}{72}$
5	$\frac{4}{72}$	$\frac{3}{72}$	$\frac{24}{72}$	$\frac{4}{72}$	$\frac{4}{72}$	$\frac{0}{72}$	$\frac{0}{72}$
6	$\frac{23}{64}$	$\frac{0}{64}$	$\frac{3}{64}$	$\frac{3}{64}$	$\frac{13}{64}$	$\frac{0}{64}$	$\frac{8}{72}$
8	$\frac{12}{60}$	$\frac{10}{60}$	$\frac{9}{60}$	$\frac{3}{60}$	$\frac{14}{60}$	$\frac{1}{60}$	$\frac{12}{72}$
9	$\frac{11}{64}$	$\frac{10}{64}$	$\frac{17}{64}$	$\frac{4}{64}$	$\frac{11}{64}$	$\frac{3}{64}$	$\frac{8}{64}$
12	$\frac{9}{66}$	$\frac{11}{66}$	$\frac{13}{66}$	$\frac{6}{66}$	$\frac{15}{66}$	$\frac{1}{66}$	$\frac{6}{72}$
13	$\frac{20}{56}$	$\frac{16}{56}$	$\frac{7}{56}$	$\frac{0}{56}$	$\frac{21}{56}$	$\frac{4}{56}$	$\frac{17}{72}$
15	$\frac{8}{72}$	$\frac{25}{72}$	$\frac{10}{72}$	$\frac{5}{72}$	$\frac{10}{72}$	$\frac{0}{72}$	$\frac{0}{72}$
16	$\frac{2}{72}$	$\frac{40}{72}$	$\frac{11}{72}$	$\frac{13}{72}$	$\frac{20}{72}$	$\frac{0}{72}$	$\frac{0}{72}$

SUBJECT #3

DATE	BEHAVIOUR							
	Ball Play	Cylinder Play	Peg Play	Drum-ing	Throw-ing	Scream-ing	Mouth-ing	
11	$\frac{9}{72}$	$\frac{29}{72}$	$\frac{18}{72}$	$\frac{14}{72}$	$\frac{0}{72}$	$\frac{11}{72}$	$\frac{11}{72}$	
12	$\frac{1}{72}$	$\frac{12}{72}$	$\frac{4}{72}$	$\frac{30}{72}$	$\frac{21}{72}$	$\frac{31}{72}$	$\frac{15}{72}$	
15	$\frac{2}{65}$	$\frac{5}{65}$	$\frac{22}{65}$	$\frac{16}{65}$	$\frac{11}{65}$	$\frac{8}{65}$	$\frac{13}{65}$	
16	$\frac{9}{72}$	$\frac{2}{72}$	$\frac{15}{72}$	$\frac{12}{72}$	$\frac{32}{72}$	$\frac{34}{72}$	$\frac{5}{72}$	
18	$\frac{1}{72}$	$\frac{0}{72}$	$\frac{4}{72}$	$\frac{27}{72}$	$\frac{34}{72}$	$\frac{24}{72}$	$\frac{18}{72}$	
23	$\frac{0}{48}$	$\frac{2}{48}$	$\frac{0}{48}$	$\frac{25}{48}$	$\frac{8}{48}$	$\frac{2}{48}$	$\frac{7}{48}$	
25	$\frac{1}{72}$	$\frac{1}{72}$	$\frac{3}{72}$	$\frac{21}{72}$	$\frac{17}{72}$	$\frac{5}{72}$	$\frac{7}{72}$	
26	$\frac{7}{72}$	$\frac{3}{72}$	$\frac{17}{72}$	$\frac{12}{72}$	$\frac{14}{72}$	$\frac{6}{72}$	$\frac{3}{72}$	OVERCOR-RECTION
June 8	$\frac{1}{36}$	$\frac{7}{36}$	$\frac{1}{36}$	$\frac{5}{36}$	$\frac{12}{36}$	$\frac{0}{36}$	$\frac{5}{36}$	$\frac{36}{72}$
9	$\frac{1}{52}$	$\frac{16}{52}$	$\frac{1}{52}$	$\frac{14}{52}$	$\frac{14}{52}$	$\frac{2}{52}$	$\frac{3}{52}$	$\frac{20}{72}$
12	$\frac{0}{24}$	$\frac{3}{24}$	$\frac{1}{24}$	$\frac{4}{24}$	$\frac{8}{24}$	$\frac{0}{24}$	$\frac{3}{24}$	$\frac{48}{72}$
13	$\frac{0}{6}$	$\frac{0}{6}$	$\frac{0}{6}$	$\frac{0}{6}$	$\frac{2}{6}$	$\frac{0}{6}$	$\frac{2}{6}$	$\frac{42}{48}$
15	$\frac{0}{7}$	$\frac{0}{7}$	$\frac{0}{7}$	$\frac{2}{7}$	$\frac{0}{7}$	$\frac{0}{7}$	$\frac{5}{7}$	$\frac{65}{72}$
16	$\frac{0}{9}$	$\frac{0}{9}$	$\frac{0}{9}$	$\frac{0}{9}$	$\frac{0}{9}$	$\frac{0}{9}$	$\frac{9}{9}$	$\frac{64}{72}$